Translation of the pertinent portions of JP09-002832:

[0021] A top plate 31 formed with an opening 30 having a diameter large enough for the optical fiber preform 15 to pass through is attached to the upper end of the preform storing tube 25 and gas introducing tube 27, and a shutter ring 33 formed with an opening 32 having a small diameter through which the support bar 18 penetrates is superposed on the top plate 31. An annular heat-preserving heater 34 which heats the upper end portion of the upper chamber 24 is attached to the upper end portion of the thermal insulating material 26, which preserves the heat inside the upper chamber 24, so as to surround the upper end portion of the thermal insulating material 26. A control device 35 for on/off controlling the electricity applied to the heat-preserving heater 34 is connected to the heat-preserving heater 34. A temperature sensor 36 for detecting the atmospheric temperature of the upper end portion of the upper chamber 24 is connected to the control device 35, and detected information from the temperature sensor 36 is outputted to the control device 35.

11 [0022] The upper end portion of the upper chamber 24 is heated appropriately by the heat-preserving heater 34 so as to prevent heat convection of the atmospheric gas between the upper end portion of the

upper chamber 24 and the part surrounded by the furnace core pipe 14.

12 [0023] Fig. 2 shows the state of temperature distribution within the furnace from the upper end to the lower end of the furnace upon the completion of a drawing operation performed on the optical fiber preform 15. The solid line represents the present invention, and the broken line shows a conventional case in which the heat-preserving heater 34 is not used. It is learned that in a conventional optical fiber drawing furnace in which the heat-preserving heater 34 is not used, the temperature of the upper end portion of the upper chamber 24 upon the completion of a drawing operation performed on the optical fiber perform 15 falls to 100°C or less.

13 [0024] Fig. 3 shows temperature change in the central portion of the upper chamber throughout the course of a drawing operation. As in Fig. 2, the solid line represents the present invention and the broken line shows a conventional case in which the heat-preserving heater 34 is not used. In this case, the optical fiber preform 15 is used at a length of 800mm, and it is learned that when the surplus length thereof reaches or falls below half of its initial length, the temperature in the central portion of the upper chamber 24 in a vertical direction falls rapidly in the

conventional optical fiber drawing furnace.

14 [0025] Fig. 4 shows change in the amount of variation in the outer diametrical dimensions of the drawn optical fiber 16. As in Figs. 2 and 3, the solid line represents the present invention and the broken line shows a conventional case in which the heat-preserving heater 34 is not used. It is learned from Fig. 4 that when the surplus length of the optical fiber preform 15 falls below half of its initial length, the amount of variation in the outer diametrical dimensions of the optical fiber 16 gradually increases.

15 [0026] When the optical fiber 16 was drawn at a diameter of 125μm using the optical fiber drawing furnace shown in Fig. 1 without applying electricity to the heat-preserving heater 34, and the relationship between the atmospheric temperature in the upper end portion of the upper chamber 24 and the amount of variation in the outer diametrical dimensions of the drawn optical fiber 16 was investigated, the correlation shown in Fig. 5 was obtained.

16 [0027] According to the above results, when the atmospheric temperature in the upper end portion of the upper chamber 24 of the optical fiber drawing furnace falls below 100°C, the amount of variation in the outer diametrical dimensions of the optical fiber 16 increases to ±0.4μm or more, and thus the

atmospheric temperature in the upper end portion of the upper chamber 24 of the optical fiber drawing furnace must be maintained at 100°C or more. In particular, if it is necessary to reduce the amount of variation to ±0.2μm or less, the atmospheric temperature in the upper end portion of the upper chamber 24 is preferably maintained at 200°C or above. If the atmospheric temperature in the upper end portion of the upper chamber 24 is maintained at 400°C or above, the amount of variation in the outer diametrical dimensions of the optical fiber 16 can be suppressed to less than ±0.1μm, but even if the temperature is maintained at 700°C or more, the amount of variation in the outer diametrical dimensions of the optical fiber 16 cannot be improved any further. It is therefore effective to maintain the atmospheric temperature of the upper end portion of the upper chamber 24 within a range of 100°C to 700°C, and more preferably within a range of 200°C to 400°C.

[0028] Accordingly, the aforementioned control device 35 on/off controls the electricity applied to the heat-preserving heater 34 on the basis of detected information from the temperature sensor 36 such that the atmospheric temperature in the upper end portion of the upper chamber 24 reaches approximately 300°C, whereby the amount of diametrical variation in the

optical fiber 16 reaches ±0.1μm.

18 [Brief Description of the Drawings]

19 [Fig. 1] Fig. 1 is a sectional view showing the schematic constitution of one embodiment of an optical fiber drawing furnace according to the present invention which is capable of realizing the method of the present invention.

20 [Fig. 2] Fig. 2 is a graph showing temperature distribution along the vertical direction of the embodiment shown in Fig. 1 and a conventional optical fiber drawing furnace, respectively, both in a state in which the surplus length of an optical fiber preform has been shortened.

21 [Fig. 3] Fig. 3 is a graph showing temperature change at the upper end portion of an upper chamber in the embodiment shown in Fig. 1 and a conventional optical fiber drawing furnace, respectively.

22 [Fig. 4] Fig. 4 is a graph showing the course of diametrical variation in the optical fiber of the embodiment shown in Fig. 1 and a conventional optical fiber drawing furnace, respectively.

23 [Fig. 5] Fig. 5 is a graph showing the relationship between the atmospheric temperature of the upper end portion of the upper chamber and the amount of variation in the diameter of the optical fiber.

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24 [Explanation of Reference Symbols]

25 cooling jacket

26 thermal insulating material

27 furnace body

28 furnace core pipe

29 optical fiber preform

30 optical fiber

31 carbon heater

32 supporting bar

33 cooling jacket

34 lower chamber

35 extension tube

36 opening

37 sealing plate

38 upper chamber

39 preform storing tube

40 thermal insulating material

41 gas introducing tube

42 gas supply pipe

43 gas inlet

44 opening

45 top plate

46 opening

47 shutter ring

48 heat-preserving heater

49 control device

50 temperature sensor